

D.C. MOTORS

GEARMOTORS

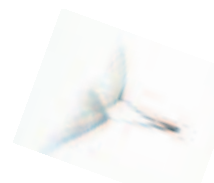


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## CERTIFICATION

Dagu s.r.l. is a company that has grown over the years fairly quickly thanks to a constant commitment to the design, development and production of electric motors manufactured to meet the specific needs of a range of customers.

In 2001, in reward for its constant efforts, the company obtained the ISO 9001:2008 quality certification and in 2004 the environmental certification ISO 14001. Beyond these achievements the company has recently obtained permission to use the UL/CSA markings on products: all our motors already carry EC markings and many also that of UL/CSA.





### Dagu and the environment

Dagu has always considered respect for the environment and the ecosystem to be important and its company policies take account of the environmental impact of its activities, products and services.

Dagu is committed to involving all the company functions in proportion to their resources, both human and financial, in a process of ongoing improvement aimed at preventing pollution and respecting the environment.

In this sense, the company pays particular attention to aspects connected with emissions into the atmosphere and the production of scrap, acknowledging the need to reduce waste and the consumption of natural resources.

The company also promotes its environmental policy outside the production site, drawing the attention of its suppliers, clients and public bodies to the importance of the environmental factor.

### Conformity

Compliance with the laws and regulations currently in force is the basis for improvement of environmental performance. For this reason Dagù is committed not only to compliance with the legislation and regulations applicable to its production site but also to constant updating of information on the current standards.

### Training and communication

Involving all levels of the company, Dagù follows a campaign of awareness, training and information on the environmental repercussions of its production cycle. Dagù undertakes to adopt transparent forms of communication with the public both for promotion of the company's environmental policy and for input of opinions, ideas and suggestions from the outside, valuable for critical re-examination of the objectives and environmental goals established by the company.

### The product and the environment

Design of the Dagù motors entails not only liaising with clients to pinpoint their needs but also the use of a calculation program for motors which can accurately plot their characteristic curves. This reduces the amount of metal scrap produced compared to the construction of prototypes by trial and error.

Specific sizing of the motor ensures that it operates at maximum efficiency, minimising the use of electricity.

In production of the motors, the suppliers are encouraged to adopt environment-friendly production methods as far as possible.

Dagù has also invested in studies on its motors in order to limit electromagnetic emissions.

Lastly, Dagù invites its clients to deliver their old motors to a specialist firm so that the recyclable materials such as steel, aluminium and copper can be recovered.

## DAGU ENVIRONMENTAL POLICY

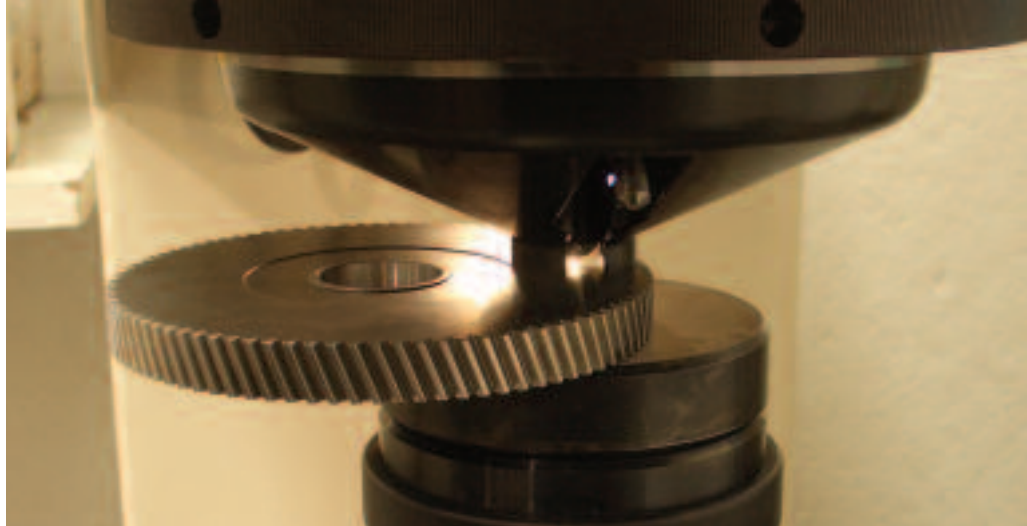
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## DAGU IS



Dagu is an innovative dynamic company with a high level of know-how and technical expertise, particularly attentive to the needs of an increasingly segmented and differentiated market. One of its strengths is its ability to develop special motors to meet personal customer needs and its recognised production capability, covering both large and small production runs.

Its in-house technical department is able to design and develop any commutator and permanent magnet electric motor, for both direct and alternating current.

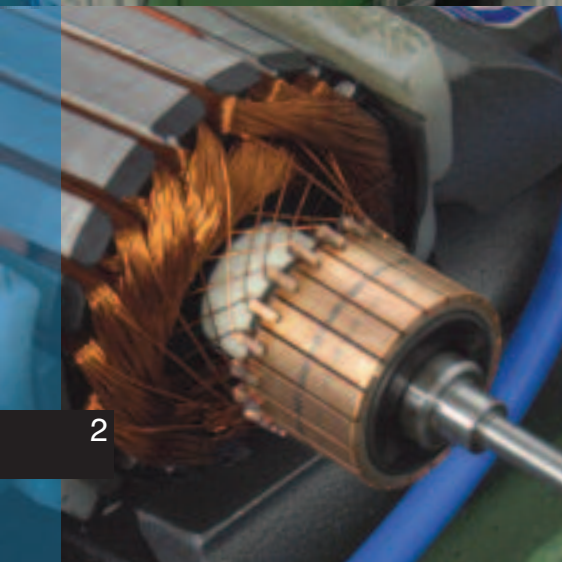
Dagu also has an advanced experimental and testing laboratory equipped with computerised data acquisition system that can perform life and mechanical stress tests. Products can be requested with UL and CSA certification, certificates of conformity and test certificates. Lastly, the company provides a highly efficient technical support service.

This is the reality underlying the quality and dependability of the Daggu products.

### Dagu proposes

The Daggu range of motors can satisfy the most specific and diverse requirements and applications, some of which are listed below:

- Powers from 30 to 2000 W for intermittent or continuous duty;
- Standard or customized construction forms and dimensions;
- Waterproof or open motors with different degrees of protection;
- EMI suppression filters (standard in many motors);
- Position, speed and shifting sensors such as encoders, can be fitted on request;
- Electromagnetic brakes on request;
- Reduction gears on request;
- Incorporated or separate electronic controls on request.



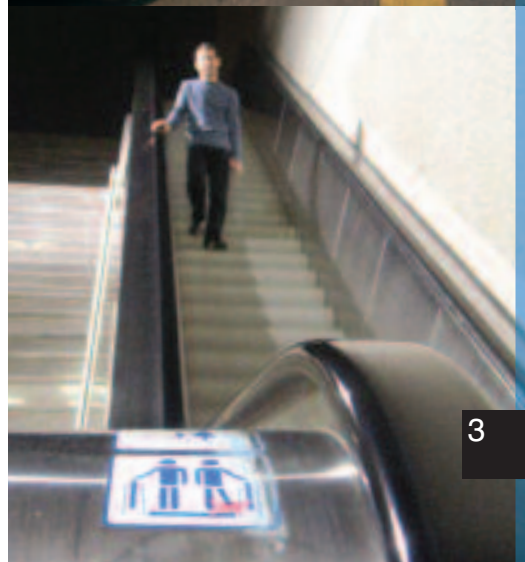


Dagu's motors and gearmotors are used in many sectors. The main fields of application are listed below:

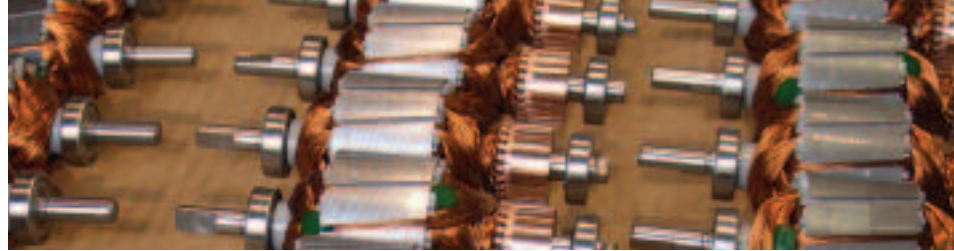
- *Nautical: anchor winches, hydraulic control units, sail positioning, marine scooters;*
- *Industrial machines: machine tools, automatic machines, robots, textile machines, conveyor belts;*
- *Packaging machines*
- *Door opening automation: electric gates, automatic doors, turnstiles, automatic safety doors, barriers;*
- *Railway applications: step, door closing, points, compressors;*
- *Robotics: robot movement;*
- *Automotive sector;*
- *Small on-board lorry hoists;*
- *Solar panel adjustment;*
- *Industrial cleaning machines: sweepers, washer-dryers;*
- *Wheelchairs for the disabled and electric vehicles;*
- *Motorised wheels;*
- *Safety motors;*
- *Lifts;*
- *Freight hoists;*
- *Lift trucks;*
- *Motor with combination of planetary and worm gear;*
- *Compact gearmotors;*
- *Planetary gearmotors;*
- *Motors and gearmotors, with brake, encoder and thermal protection.*



## APPLICATIONS OF DAGU'S PRODUCTS







Useful hints on choosing the right motor are given below.

#### A Permanent Magnet Dc Motor Is Preferable:

- When the required speeds exceed the speeds linked to the network frequency;
- When a battery or accumulator power supply is required;
- When a high starting torque is required (Fig. 3);
- When speed variation is required without resorting to expensive electronics.

#### An Asynchronous Ac Motor Is Preferable:

- When fixed speeds determined by the frequency of power supply network can be used (e.g. 2800, 1400, 950 rpm);
- When higher speed stability is required (Fig. 1);
- When an inverter can be fitted for continuous speed change;
- When the motor is exposed to heavy duty, thus reducing maintenance.

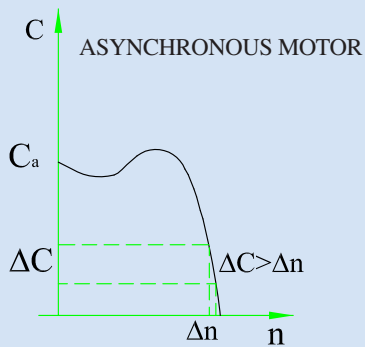


Fig. 1

Torque curve depending on the revs

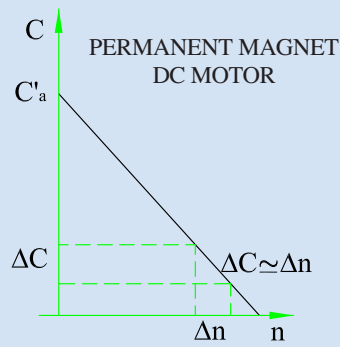


Fig. 2

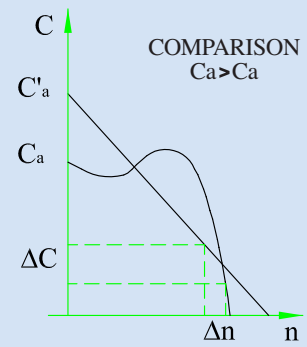


Fig. 3

If the following physical principles are not taken into consideration, a wrong choice of the motors and supply system could be made.

Dagu S.r.l. is the ideal partner to produce the properly selected motor. It is possible to obtain a general guideline by evaluating the torque "C" and the torque constant "K<sub>c</sub>". By making the two formulas equal for the useful power "P<sub>U</sub>" of the motor:

$$P_U = C \cdot \frac{2\pi \cdot n}{60} \quad (1) \quad P_U = E \cdot I \quad (2)$$

we obtain

$$C = \frac{60 \cdot E}{2\pi \cdot n} \cdot I \quad (3)$$

if in (3) I put  $n = n_0$  man can say that  $E = V$  and since  $n_0 \approx n'$  we have:

$$K_C = \frac{60 \cdot E}{2\pi \cdot n_0} \cong \frac{60 \cdot V}{2\pi \cdot n'} \quad (4)$$

Formula (4) shows that by increasing the supply voltage and/or reducing the revs, the torque constant increases, therefore on parity of useful torque (3) supplied to the axis, the input current to the motor decreases.

Formula (4) also shows that the torque constant does not depend on the size of the motor. With equal values for  $K_C$ . The bigger or stronger motor is the one that can absorb more current without damage itself and therefore supply more torque to the shaft.

The graph in Fig. 4 compares different sized motors (1) where the sketched curves are relative to the power calculated by the expression.

$E$  = Inducted electro-motive force  
 $V$  = Unloaded voltage  
 $I$  = Input current based on load  
 $n_0$  = Revs at zero current  
 $n$  = Revs unloaded  
 $n'$  = No-load revolutions

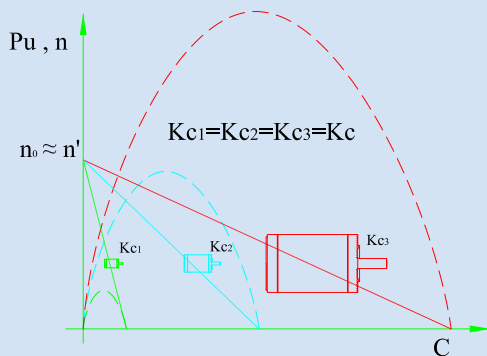
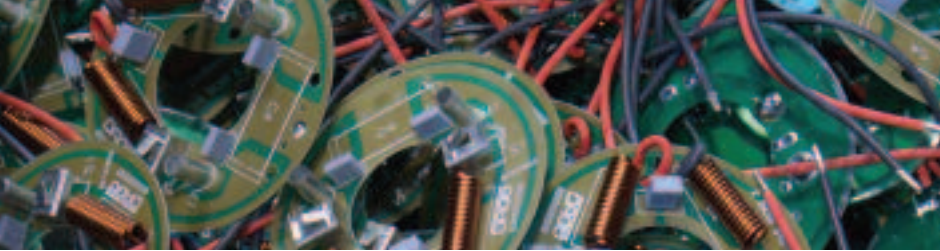


Fig. 4

## THE CHOICE OF MOTOR

## TORQUE CONSTANT K<sub>c</sub>



It is also important to consider the form factor “Kf” of the power supply unit used. If the current flowing through the motor has a form factor higher than one, the motor will overheat because dissipation increases. This proportionately shortens the life of the motor, because the brushes are exposed to excessive heat due to the greater current peak value. Subsequently, the useful power of the motor is de-rated by  $1/K_f$  as shown in Fig. 5.

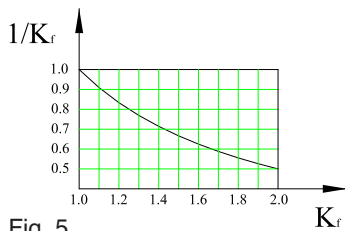
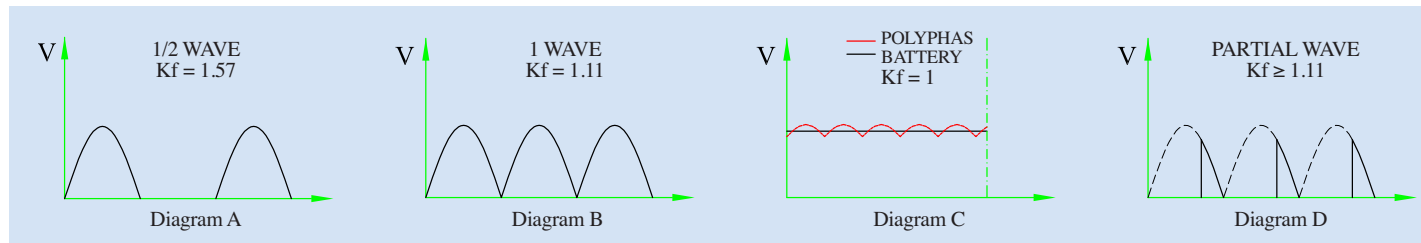


Fig. 5 These factors considerably influence the speed of the motor; the speed increases with the increase in the form factor of the voltage. Therefore, when buying a motor, it is important to specify the type of power supply used, as illustrated by the sample diagrams below:



“Duty” defines the load the motor is subjected to and may include (if applicable) the following phases: start-up, dynamic braking, idling and rest, as well as their duration and time sequence (EN 60034-1). The most common types of duty are defined below with codes from S1 to S9.

### Continuous Running Duty - S1

Operation at a constant load maintained for sufficient time to allow the machine to reach thermal equilibrium (Fig. 6).

### Short-Time Duty - S2

Operation at constant load for a given time less than that required to reach thermal equilibrium, followed by a rest period of sufficient duration to re-establish equality between the temperature of the machine and the fluid. The appropriate abbreviation is S2 followed by the length of service. Example: S2 60 min.

### Intermittent Periodic Duty - S3

A sequence of identical duty cycles, each including a time of operation at constant load and a time at rest and de-energized. In this duty, the cycle is such that the starting current does not significantly affect the temperature rise (Fig. 8). The appropriate abbreviation is S3, followed by the cyclic duration factor. Example: S3 25%

### Ratio Between S1 And S3

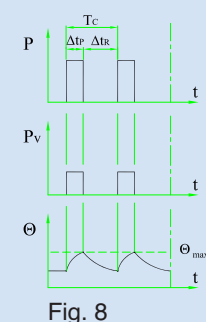
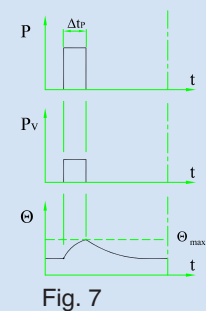
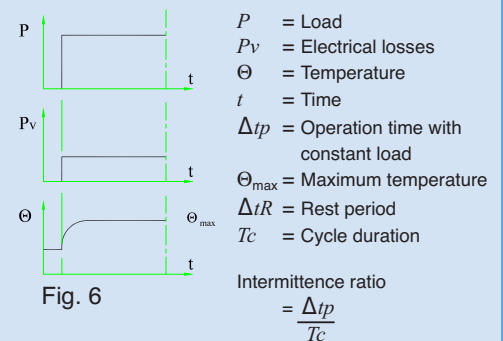
A motor designed for S1 continuous duty, which during rated function dissipates a power equal to  $\Delta P_1$ , can also be used for S3 regular intermittent duty, dissipating  $\Delta P_3$ , on condition that the “ $\Delta t_p$ ” run time and the “ $T_c$ ” cycle comply with the ratio:  $\frac{\Delta P_1}{\Delta P_3} = \frac{\Delta t_p}{T_c}$

### Ratio between S1 and S2

To use a motor designed for S1 in S2 duty, ask Dagu S.r.l. for the temperature curves.

## POWER SUPPLY

## DUTY





## STARTING OR BREAKING DYNAMIC

It can be useful to know the starting or braking dynamic of the motor. Starting time at a **constant supply** current is:

$$t = \frac{\pi \cdot n_i \cdot J_{tot}}{30 \cdot K_c \cdot I}$$

where:

$n_i$  = maximum motor speed with constant current input [min<sup>-1</sup>]

$I$  = input constant current [A]

$K_c$  = torque constant [Nm/A]

$J_{tot}$  = moment motor's inertia plus the moments of inertia added to the motor's shaft [m<sup>2</sup> kg] (see tab. 6)

Time starter with a **constant voltage power supply** is calculated using the time constant  $\tau$ :

$$\tau = \frac{R_{tot} \cdot J_{tot}}{2 \cdot K_c^2}$$

where:

$R_{tot}$  = total resistance (armature and power cable) in W [ $\Omega$ ]

$J_{tot}$  = moment motor's inertia plus the moments of inertia added to motor's shaft [m<sup>2</sup> kg] (see tab. 6)

Starting is accomplished at 3÷5 $\tau$ .

Speed during starting:

$$n_x = n_0 \left[ 1 - e^{-\frac{t}{\tau}} \right]$$

Concentrated mass	$J = m \cdot r^2$	
Full cylinder	$J = \frac{m \cdot r^2}{2}$	
Mould cylinder	$J = \frac{m \cdot (R^2 + r^2)}{2}$	
Reduced inertia to motor's shaft $J_m$	$J_m = J_r \cdot \left( \frac{n_r}{n_m} \right)^2$	

Tab. 6

$m$  = mass [kg]

$r, R$  = internal and external rays [m]





Dagu has a technical department for the realisation of new projects at its clients' disposal, provided with computerised data acquisition system for performing bench tests on the motors and identifying all the real parameters; in the test room, life and mechanical stress tests can be performed on the motors and components. Dagu offers all the technical support necessary to develop innovative solutions and customize its products. On request, Dagu's motors can be produced in material complying with the RoHS directive and can be UL certified.

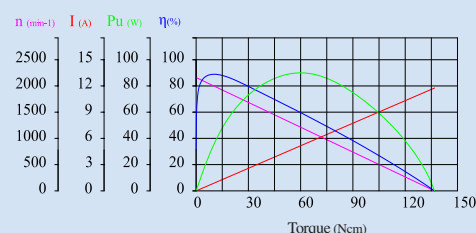
TABELLA DEI PARAMETRI	MEANING
<b>MOTORE: ME45 028 ABC123</b>	<b>SERIES / TYPE / MOTOR NAME</b>
TEMPERATURA DI PROVA [°C]	temp. at which motor calculations are performed
COSTANTE DI COPPIA [Nm/A]	torque generated according to current
TENSIONE GENERATORE [V]	power supply voltage
RES. INT. GENERATORE	generator internal resistance
RES. LINEA ALIM. [Ohm]	power supply line resistance
NUMERO DI POLI (2p)	number of motor poles
NUMERO DI VIE INTERNE (2a)	number of motor inner paths
RES. INDOTTO EFFETTIVA (Ro) [Ohm]	armature resistance
RES. DEL MOTORE (Rm) [Ohm]	resistance at motor terminals
GIRI A CORRENTE ZERO (n <sub>0</sub> ) [min <sup>-1</sup> ]	revs at zero current (theoretical revs)
NUMERO DI GIRI A VUOTO (n') [min <sup>-1</sup> ]	no-load revolutions
COPPIA MIN. DI SPUNTO [Nm]	minimum starting torque
RENDIMENTO MASSIMO (η)	maximum efficiency
INDUTTANZA [mH]	motor inductance

In the technical department new projects are studied and developed by highly specialised and qualified personnel. The characteristic curves of the motors are known before production thanks to our spreadsheet, a copy of which can be sent to the client together with any graphs and drawings enclosed with the offer. The datasheet is a mathematical tool used to define the motor specifications. The following values are given in the columns:

Cx Nm	nx min <sup>-1</sup>	Ix A	Pux W	Pax W	ηx	ΔP W	Vax V	Service% ΔT 55°C
0.000	1909	0.4	4.7	4.8	1.0	0.1	12.0	100
0.063	1814	1.06	11.8	12.7	0.9	0.9	12.0	100
0.125	1718	2.12	22.4	25.4	0.9	3.0	12.0	100
0.188	1623	3.18	31.8	38.2	0.8	6.4	12.0	100
0.251	1527	4.25	39.9	50.9	0.8	11.0	12.0	100
0.314	1432	5.3	46.7	63.6	0.7	16.9	12.0	100
0.376	1336	6.36	52.3	76.3	0.7	24.0	12.0	94
0.439	1241	7.42	56.7	89.0	0.6	32.4	12.0	88
0.502	1145	8.48	59.8	101.8	0.6	42.0	12.0	82
0.564	1050	9.54	61.6	114.5	0.5	52.8	12.0	76
0.627	955	10.6	62.3	127.2	0.5	64.9	12.0	70
0.690	859	11.66	61.6	139.9	0.4	78.3	12.0	64
0.752	764	12.72	59.8	152.6	0.4	92.9	12.0	58
0.815	668	13.78	56.7	165.4	0.3	108.7	12.0	52
0.878	573	14.84	52.3	178.1	0.3	125.8	12.0	46
0.941	477	15.9	46.7	190.8	0.2	144.1	12.0	40
1.003	382	16.96	39.9	203.5	0.2	163.7	12.0	34
1.066	286	18.02	31.8	216.2	0.1	184.5	12.0	28
1.129	191	19.08	22.4	229.0	0.1	206.5	12.0	22
1.191	95	20.14	11.8	241.7	0.0	229.8	12.0	16
1.254	0	21.2	0.0	254.4	0.0	254.4	12.0	10

The lines of datasheet give the different load conditions of the motor, for example the line highlighted in yellow shows at torque **Cx** = 0,690 the values of **nx**, **Ix**, **Pux**, etc...

## NEW PROJECTS



The following values are given in the columns:

- Cx** = torque in the various load conditions
- nx** = speed at the indicated torque
- Ix** = current at the indicated torque
- Pux** = useful power of the motor at the indicated torque value
- Pax** = electrical power input at the indicated torque value
- ηx** = efficiency at the indicated torque
- ΔP** = dissipated power
- Vax** = voltage at motor terminals
- S%** = service rate of the motor with a temperature's difference **ΔT** of the working

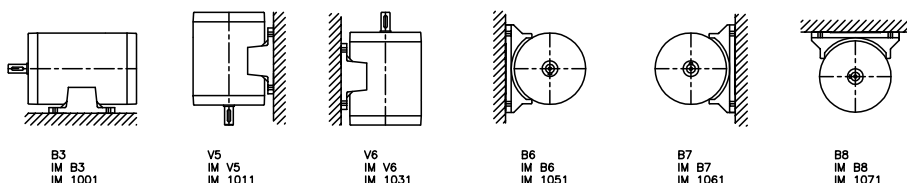


The construction types commonly used are indicated in the drawings.  
Different construction types can be supplied on request.

## CONSTRUCTION TYPES

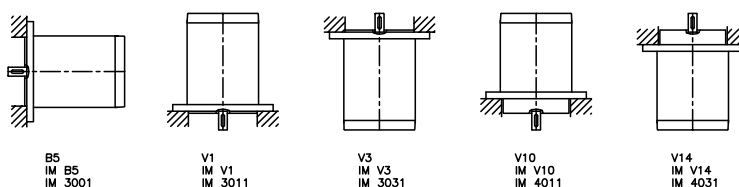
### Motors with feet

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



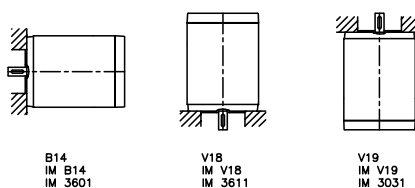
### Motors with flange with through fixing holes

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



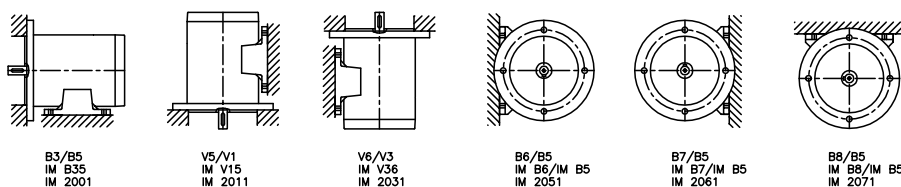
### Motors with flange with threaded fixing holes

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



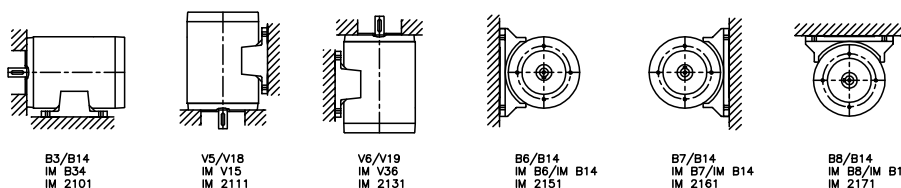
### Motors with feet and flange with through fixing holes

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



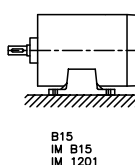
### Motors with feet and flange with threaded fixing holes

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



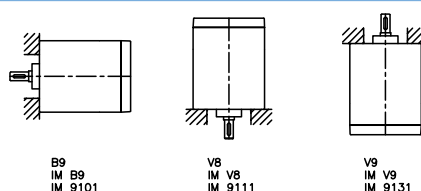
### Motors with feet without front flange

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II



### Motors without feet and front flange

CEI 2-14  
IEC 34-7 code I  
IEC 34-7 code II





No motor may be energised until the machine in which it is incorporated has been judged suitable and compliant with the safety standards in force.

To avoid exposing machine operators and machinery to risks, bear in mind that the starting torque of permanent magnet DC motors is much higher than the nominal load torque.

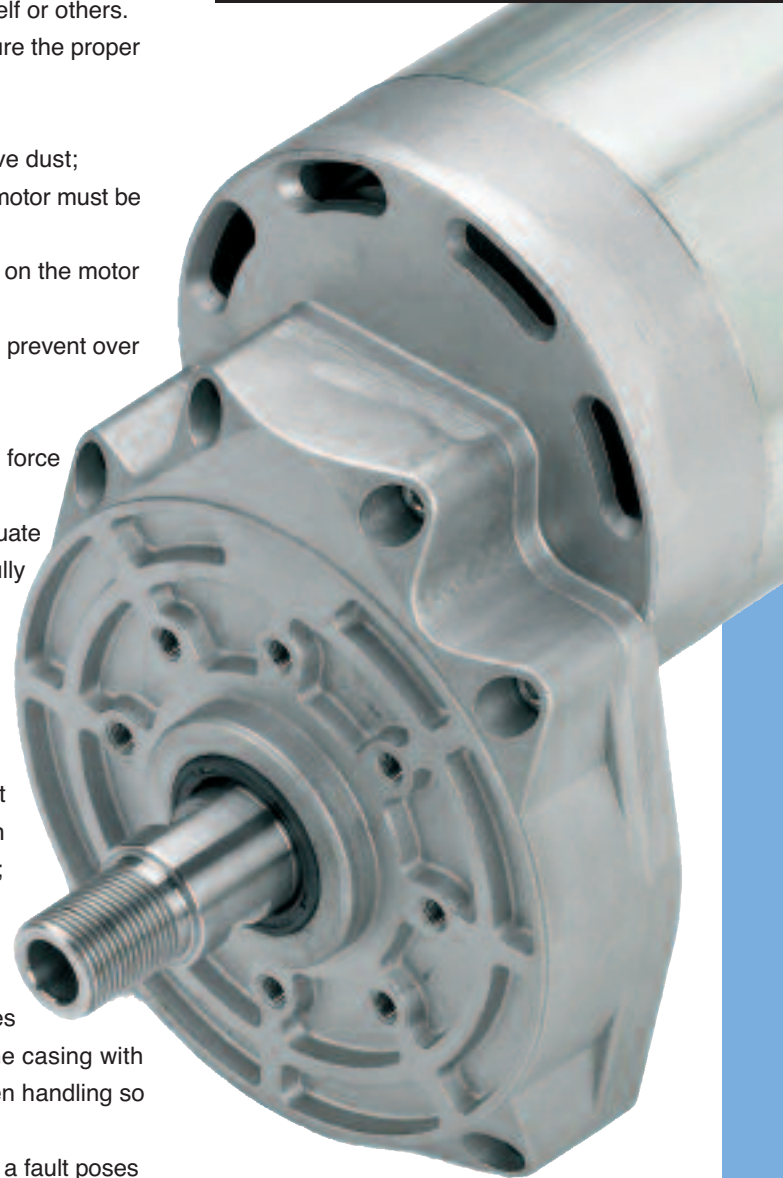
When using brushed DC motors, the power cables must be provided with a means for preventing the occurrence of irradiated or conducted electromagnetic interfere with the electrical and electronic devices installed on the machine itself or others. The packaging of the motor to be launched collection in order to ensure the proper recovery and disposal of material which is composed.

The motor:

- can not be used in environments with gases, flammable or explosive dust;
- when installed outdoors or in damp or corrosive environments, the motor must be adequately protected;
- the power supply voltage must correspond to the voltage indicated on the motor rating plate;
- suitable safety and electric insulation systems must be employed to prevent over voltage to the windings or to the entire motor;
- live parts shall not be directly accessible;
- the motor must be earthed if and as prescribed by the standards in force in the country of use;
- connections must be performed in a workmanlike manner and adequate wire gauges must be used. The terminals must be tightened carefully and the poles insulated where necessary;
- for form factors greater than one, reduce the useable capacity proportionally (dividing by the form factor);
- shocks and vibrations above  $0.5 \text{ m/s}^2$  damage the motor, therefore the motor must be adequately secured and supported;
- when the motor is switched on or in use, the demagnetizing current indicated on the rating plate should never be exceeded, not even transitionally, since such an occurrence would damage the motor;
- if used to replace an existing motor make sure that the motor characteristics are fully compatible and that the motors are fully interchangeable so as to avoid damage to persons or to the machine;
- the external casing of the motor may reach very high temperatures during use, and these may prevail for a very long time. Provide the casing with protection against accidental contact and be extremely careful when handling so as to avoid burns;
- the motor may not work and its shaft remain idle or blocked. If such a fault poses any risks, adequate precautions must be taken;
- the temperature of the windings must not exceed  $145^\circ\text{C}$  for motors destined for the UL and  $155^\circ\text{C}$  for motors destined for the EC, which corresponds to a casing temperature of  $85/90^\circ\text{C}$  above which the due controls must be made;
- do not use the motor as a support or constraint for other functional or safety parts.

## GENERAL INSTRUCTIONS

for installation and use of the direct current commutator and permanent magnet electric motors







# DEGREE OF PROTECTION

The degrees of protection (IP) is expressed by a code formed by the letters “IP” followed by two numbers indicating conformity with the conditions shown in Tab. 10. The first digit-number indicates the degree of protection provided by the enclosure to persons and to the parts of the machine inside the enclosure. The second digit-number indicates the degree of protection provided by the enclosure with respect to harmful effects due to ingress of water.

First specification number		Second specification number	
IP	Description	IP	Description
0	Non-protected machine	0	Non-protected machine
1	Machine protected against solid objects greater than 50 mm	1	Machine protected against dripping water
2	Machine protected against solid objects greater than 12 mm	2	Machine protected against dripping water when tilted up to 15°
3	Machine protected against solid objects greater than 2,5 mm	3	Machine protected against spraying water
4	Machine protected against solid objects greater than 1 mm	4	Machine protected against splashing water
5	Dust-protected machine	5	Machine protected against water jets
6	Dust-tight machine	6	Machine protected against heavy seas
		7	Machine protected against the effect of immersion
		8	Machine protected against the effect of submersion

Tab. 10

# PRODUCT’S IDENTIFICATION

The following is an outline and a legend that aim to facilitate the interpretation of the codes that distinguish the various models of motors.

- ME** = Electric motor
- MRE** = Planetary gearmotor
- MRI** = Gearmotor
- MRV** = Worm gearmotor

SERIES	TYPE	PRODUCT’S NAME	VOLTAGE	LOAD SPEED	POWER	SERVICE	DEGREE OF PROTECTION	FORM
<b>ME45</b>	<b>035</b>	<b>ABC123</b>	<b>12V</b>	<b>3000 min<sup>-1</sup></b>	<b>50W</b>	<b>S1</b>	<b>IP44</b>	<b>56B14</b>

GEARMOTOR SERIES	MOTOR SERIES	MOTOR TYPE	GEAR’S SIZE	REDUCTION RATIO	PRODUCT’S NAME	VOLTAGE	OUTPUT	OUTPUT TORQUE	SERVICE	DEGREE OF PROTECTION
<b>MRE</b>	<b>45</b>	<b>035</b>	<b>80.2</b>	<b>136</b>	<b>ABC123</b>	<b>12V</b>	<b>25 min<sup>-1</sup></b>	<b>20Nm</b>	<b>S1</b>	<b>IP44</b>
<b>MRV</b>	<b>45</b>	<b>035</b>	<b>30</b>	<b>7</b>	<b>ABC123</b>	<b>12V</b>	<b>25 min<sup>-1</sup></b>	<b>20Nm</b>	<b>S1</b>	<b>IP44</b>
<b>MRI</b>	<b>71</b>	<b>036</b>	<b>66</b>	<b>10</b>	<b>ABC123</b>	<b>12V</b>	<b>25 min<sup>-1</sup></b>	<b>20Nm</b>	<b>S1</b>	<b>IP44</b>



Type	V <sub>n</sub> [V]	n [min <sup>-1</sup> ]	C <sub>n</sub> [Nm]	P <sub>u</sub> [W]	K <sub>c</sub> [Nm/A]	J [kg.m <sup>2</sup> ]	R <sub>term</sub> [°C/W]	R <sub>m</sub> [Ω]	Ind [mH]	Weight [Kg]
035	12	1500	0.13	20	0.065	0.0001	3.6	1.00	2.30	1.1
	24		0.17	25	0.129			4.00	8.80	
	12	3000	0.13	40	0.032			0.35	0.70	
	24		0.15	45	0.065			1.40	2.70	
065	12	1500	0.26	40	0.065	0.0002	3.0	0.50	1.20	1.8
	24		0.29	45	0.129			2.00	5.40	
	12	3000	0.18	55	0.032			0.14	0.40	
	24		0.20	65	0.065			0.60	1.70	
080	12	1500	0.30	45	0.065	0.00032	2.6	0.36	1.00	2
	24		0.37	55	0.129			1.38	3.70	
	12	3000	0.23	70	0.032			0.10	0.30	
	24		0.25	75	0.065			0.48	1.20	

## SERIES ME45

No-ventilated version  
with protection level IP on request.

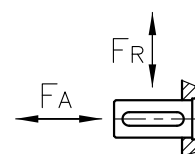
**Note:** motors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.



Available on request:

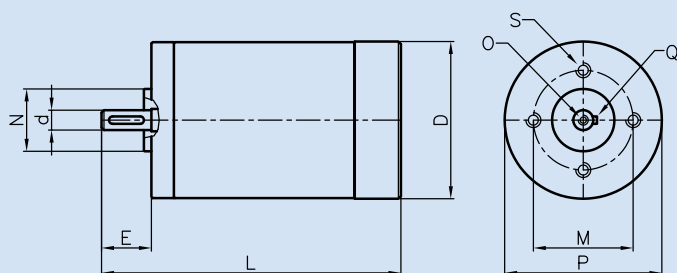
**CAUS** file E251253

Axial force: 200 N  
Radial force: 300 N

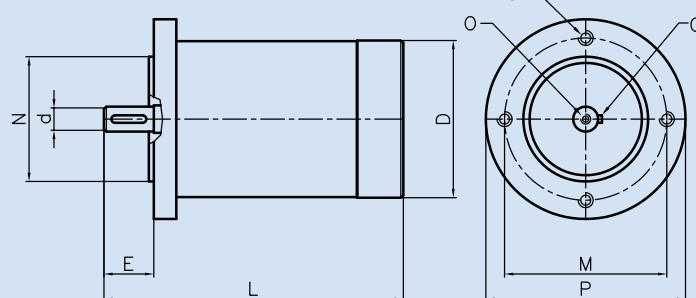


Type	D	SPEC form									Form 56B14								
		M	N	P	S	O*	d	Q*	E	L	M	N	P	S	O*	d	Q*	E	L
035	63	40	25	63	M5	M3	8	2x2	20	130	65	50	80	M5	M3	9	3x3	20	130
065	63	40	25	63	M5	M3	8	2x2	20	160	65	50	80	M5	M3	9	3x3	20	160
080	63	40	25	63	M5	M3	8	2x2	20	180	65	50	80	M5	M3	9	3x3	20	180

\*on request



Special form



Form 56B14



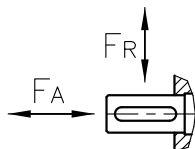
# SERIE ME56

No-ventilated version  
with protection level IP on request.

**Note:** motors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.

Available on request:

**US file E251253**



Axial force: 350 N  
Radial force: 350 N

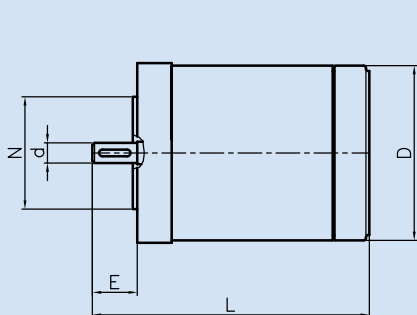
Type	V <sub>n</sub> [V]	n [min <sup>-1</sup> ]	C <sub>n</sub> [Nm]	Pu [W]	K <sub>c</sub> [Nm/A]	J [kg.m <sup>2</sup> ]	R <sub>term</sub> [°C/W]	Rm [Ω]	Ind [mH]	Wheight [Kg]
023	12	1500	0.20	30	0.065	0.00033	2.2	0.45	0.83	1.5
	24				0.129			1.80	3.32	
	180	0.971		120	187.2					
	12	3000		60	0.032			0.14	0.21	
24	0.065		0.55		0.83					
180	0.486	34	46.8							
040	12	1500	0.28	45	0.065	0.00057	2.0	0.32	1.41	1.8
	24				0.129			1.28	5.63	
	180	0.971		72	316.8					
	12	3000		90	0.032			0.08	0.35	
24	0.065		0.32		1.41					
180	0.486	20	79.2							
075	12	1500	0.88	135	0.065	0.0011	1.53	0.12	1.60	2.7
	24				0.129			0.50	7.20	
	180	0.971		31.3	420.0					
	12	3000		0.60	180			0.032	0.038	
24	0.70		220	0.065	0.15	2.00				
180	0.486				13.0	116.0				
105	12	1500	1.15	180	0.065	0.0015	1.32	0.052	0.72	4.3
	24		1.50	230	0.129			0.24	4.66	
	180	1.50	230	0.971	20.0			240.0		
	12	3000	0.55	170	0.032			0.013	0.18	
24	0.77		240	0.065	0.085	1.35				
180	0.77	240	0.486	10.6	69.0					
130	12	1000	1.52	160	0.097	0.0019	1.20	0.087	1.70	5.1
	24		1.86	190	0.194			0.35	6.70	
	180	2.00	210	1.457	20.4			375.0		
	12	1500	1.20	185	0.065			0.054	0.85	
	24		1.60	250	0.129			0.176	3.40	
	180	1.66	260	0.971	15.0			195.0		
12	2500	0.70	185	0.039	0.033	0.30				
24		1.00	260	0.078	0.075	1.20				
180	1.10	280	0.583	9.70	85.0					

Type	D	Form 56B14										Form 56B5									
		M	N	P	S	O*	d	Q	E	L		M	N	P	S	O*	d	Q	E	L	
023	77.8	65	50	80	M5	M3	9	3x3	20	128		100	80	120	7	M3	9	3x3	20	128	
040	77.8	65	50	80	M5	M3	9	3x3	20	150		100	80	120	7	M3	9	3x3	20	150	
075	83	65	50	80	M5	M3	9	3x3	20	190		100	80	120	7	M3	9	3x3	20	190	
105	83	65	50	80	M5	M3	9	3x3	20	220		100	80	120	7	M3	9	3x3	20	220	
130	83	65	50	80	M5	M3	9	3x3	20	245		100	80	120	7	M3	9	3x3	20	245	

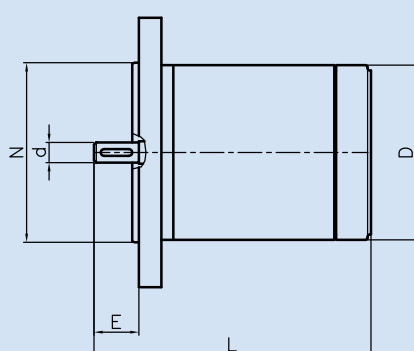
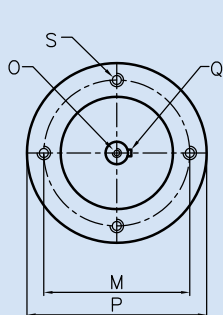
  

Type	D	Form 63B14										Form 63B5									
		M	N	P	S	O*	d	Q	E	L		M	N	P	S	O*	d	Q	E	L	
023	77.8	75	60	90	M5	M4	11	4x4	23	130		115	95	140	9	M4	11	4x4	23	130	
040	77.8	75	60	90	M5	M4	11	4x4	23	155		115	95	140	9	M4	11	4x4	23	155	
075	83	75	60	90	M5	M4	11	4x4	23	195		115	95	140	9	M4	11	4x4	23	195	
105	83	75	60	90	M5	M4	11	4x4	23	225		115	95	140	9	M4	11	4x4	23	225	
130	83	75	60	90	M5	M4	11	4x4	23	250		115	95	140	9	M4	11	4x4	23	250	

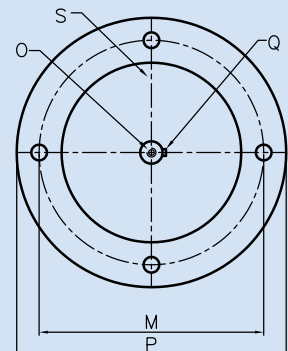
\*on request



Form B14



Form B5







Type	V <sub>n</sub> [V]	n [min <sup>-1</sup> ]	C <sub>n</sub> [Nm]	P <sub>u</sub> [W]	K <sub>c</sub> [Nm/A]	J [kg.m <sup>2</sup> ]	R <sub>term</sub> [°C/W]	R <sub>m</sub> [Ω]	Ind [mH]	Weight [Kg]
031	12	1500	0.64	100	0.065	0.0024	1.8	0.16	0.19	2.9
	24				0.129			0.60	0.77	
	180				0.971			35.0	42.0	
	12	3000		200	0.032			0.05	0.05	
24	0.065		0.20		0.19					
180	0.486		14.04		10.8					
066	12	1500	0.82	130	0.065	0.0038	1.5	0.08	0.27	4.7
	24				0.129			0.30	1.08	
	180				0.971			18.7	58.8	
	12	3000		260	0.032			0.02	0.07	
24	0.065		0.08		0.27					
180	0.486		2.46		15.12					
095	12	1500	1.00	160	0.065	0.0057	1.3	0.04	0.32	6.0
	24				0.129			0.17	1.28	
	180				0.971			9.86	15.12	
	12	3000		320	0.032			0.01	0.08	
24	0.065		0.04		0.32					
180	0.486		2.46		18.0					
130	12	1500	2.60	400	0.065	0.0078	1	0.008	0.160	7.5
	24			400	0.129			0.035	0.650	
	180			400	0.971			7.300	230.0	
	24	3000		500	0.065			0.008	0.10	
180	600		0.486			3.00	64.00			
180										

## SERIE ME63

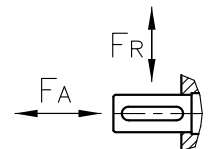
No-ventilated version  
with protection level IP on request.

**Note:** motors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.

Available on request:

**CAUS** file E251253

Axial force: 350 N  
Radial force: 400 N

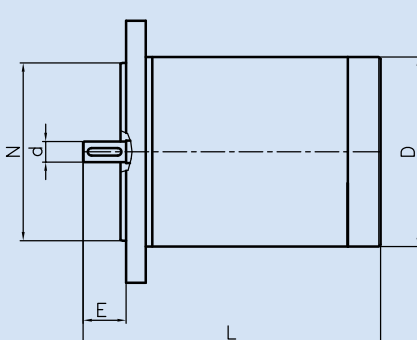


Type	D	Form 63B14									Form 63B5								
		M	N	P	S	O*	d	Q	E	L	M	N	P	S	O*	d	Q	E	L
031	101.3	75	60	90	M5	M4	11	4x4	23	155	115	95	140	9	M4	11	4x4	23	155
066	101.3	75	60	90	M5	M4	11	4x4	23	190	115	95	140	9	M4	11	4x4	23	190
095	101.3	75	60	90	M5	M4	11	4x4	23	220	115	95	140	9	M4	11	4x4	23	220
130	101.3	75	60	90	M5	M4	11	4x4	23	260	115	95	140	9	M4	11	4x4	23	260

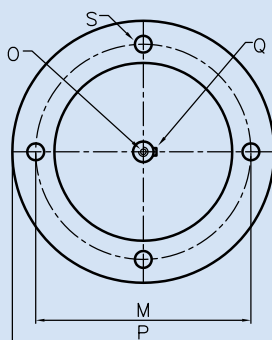
  

Type	D	Form 71B14									Form 71B5								
		M	N	P	S	O*	d	Q	E	L	M	N	P	S	O*	d	Q	E	L
031	101.3	85	70	105	M6	M5	14	5x5	30	160	130	110	160	9	M5	14	5x5	30	160
066	101.3	85	70	105	M6	M5	14	5x5	30	195	130	110	160	9	M5	14	5x5	30	195
095	101.3	85	70	105	M6	M5	14	5x5	30	225	130	110	160	9	M5	14	5x5	30	225
130	101.3	85	70	105	M6	M5	14	5x5	30	265	130	110	160	9	M5	14	5x5	30	265

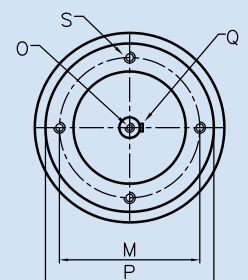
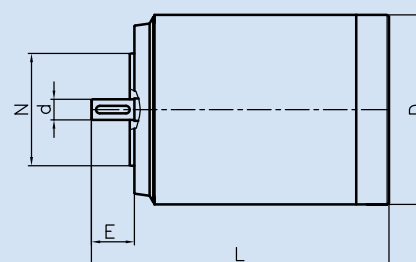
\*on request



Form B5



Form B14





# SERIES ME71

No-ventilated version  
with protection level IP on request.

**Note:** motors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.

Available on request:

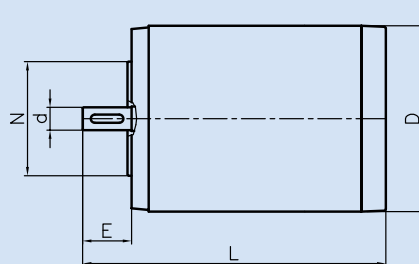
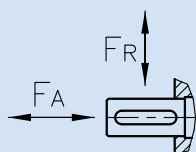
**US** file E251253

Type	V <sub>n</sub> [V]	n [min <sup>-1</sup> ]	C <sub>n</sub> [Nm]	P <sub>u</sub> [W]	K <sub>c</sub> [Nm/A]	J [kg.m <sup>2</sup> ]	R <sub>term</sub> [°C/W]	R <sub>m</sub> [Ω]	Ind [mH]	Wheight [Kg]
031	12	1500	1.10	170	0.065	0.0024	1.31	0.11	0.89	4.8
	24				0.129			0.50	3.20	
	180				0.971			27.2	366	
	12	3000	0.85	260	0.032			0.033	0.22	
	24				0.065			0.14	1.00	
	180				0.486			9.50	115.0	
066	12	1500	1.50	230	0.065	0.0038	1.13	0.046	0.42	6.3
	24			300	0.129			0.18	1.70	
	180		2.00	300	0.971			11.90	190.0	
	12	3000	1.10	350	0.032			0.01	0.10	
	24			440	0.065			0.05	0.40	
	180		1.40		0.486			4.00	54.0	
095	12	1500	2.40	380	0.065	0.0057	1.10	0.031	0.32	7.1
	24				0.129			0.10	1.10	
	180				0.971			6.30	135.0	
	12	3000	1.27	400	0.032			0.01	0.08	
	24				0.065			0.031	0.33	
	180		1.60	500	0.486			2.60	37.0	
130	12	1500	3.00	470	0.065	0.0078	0.88	0.019	0.20	11.5
	24				0.129			0.080	0.90	
	180		3.18	500	0.971			5.100	80.5	
	24	3000			0.065			0.019	0.21	
					0.486			1.800	26.3	
	180		2.00	630						

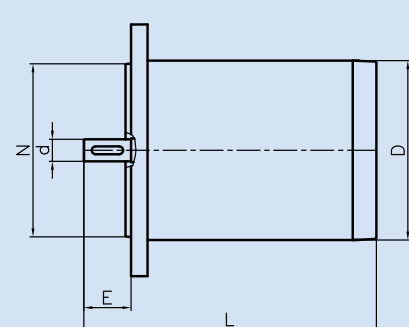
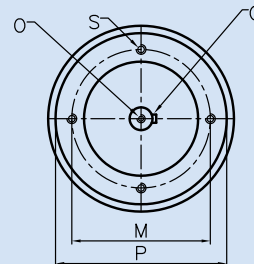
Type	D	d	E	O*	Q	M	Form 71B14				Form 71B5				Form 71B3**									
							N	P	S	L	M	N	P	S	L	H	A	B	C	S	AB	BB	HC	L
031	114	14	30	M5	5x5	85	70	105	M6	186	130	110	160	9	186	71	112	90	45	7	140	110	128	186
066	114	14	30	M5	5x5	85	70	105	M6	210	130	110	160	9	210	71	112	90	45	7	140	110	128	210
095	114	14	30	M5	5x5	85	70	105	M6	240	130	110	160	9	240	71	112	90	45	7	140	110	128	240
130	114	14	30	M5	5x5	85	70	105	M6	270	130	110	160	9	270	71	112	90	45	7	140	110	128	270

\*on request \*\* type B3/B5 and B3/B14 also available

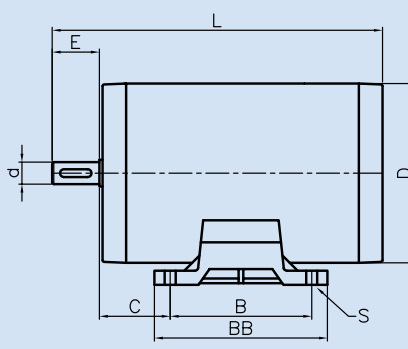
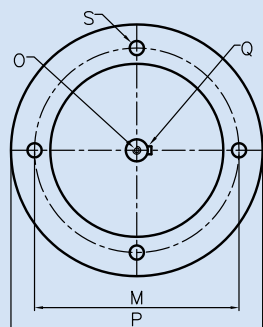
Axial force: 500 N  
Radial force: 600 N



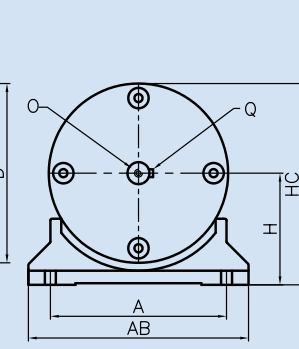
Form B14



Form B5



Form B3





Type	V <sub>n</sub> [V]	n [min <sup>-1</sup> ]	C <sub>n</sub> [Nm]	P <sub>u</sub> [W]	K <sub>c</sub> [Nm/A]	J [kg.m²]	R <sub>term</sub> [°C/W]	R <sub>m</sub> [Ω]	Ind [mH]	Wheight [Kg]	
031	12	1500	1.60	250	0.059	0.0024	3.0	0.11	0.19	3.8	
	24				0.118			0.45	0.77		
	180				0.881			25.0	42.0		
	12	3000		500	0.029			0.03	0.05		
	24				0.059			0.11	0.19		
	180				0.441			6.20	10.8		
066	12	1500	2.20	350	0.059	0.0038	2.6	0.05	0.27	5.8	
	24				0.118			0.19	1.08		
	180				0.881			11.0	58.8		
	12	3000		700	0.029			0.015	0.07		
	24				0.059			0.08	0.27		
	180				0.441			3.36	15.12		
095	12	1500	2.80	450	0.059	0.0057	2.0	0.04	0.32	7.8	
	24				0.118			0.17	1.28		
	180				0.881			9.86	72.0		
	12	3000		900	0.029			0.01	0.08		
	24				0.059			0.04	0.32		
	180				0.441			2.46	18.0		
130	12	1500	3	500	0.059	0.0078	0.5	0.04	0.32	10.2	
	24			1000	0.118			0.17	1.28		
	180			1000	0.881			9.86	72.0		
	12	3000		500	0.029			0.01	0.08		
	24			1000	0.059			0.04	0.32		
	180			1000	0.441			2.46	18.0		

## SERIES ME7IV

Ventilated version  
with protection level IP 20.

**Note:** motors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.

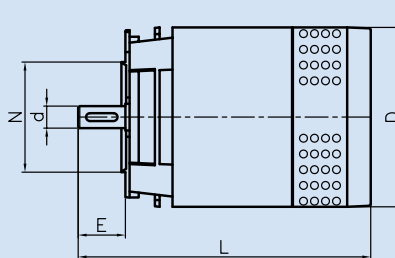
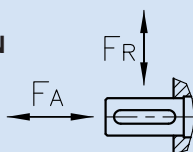
Available on request:

**CAUS** file E251253

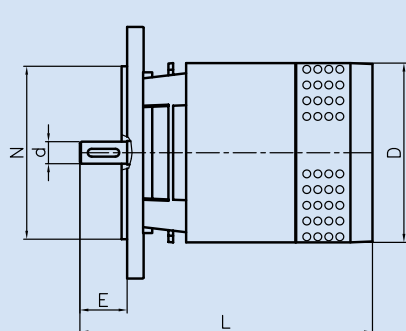
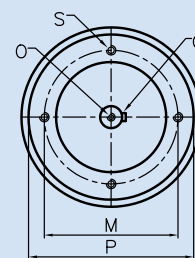
Type	D	d	E	O*	Q	M	Form 71B14				Form 71B5				Form 71B3**									
							N	P	S	L	M	N	P	S	L	H	A	B	C	S	AB	BB	HC	L
031	114	14	30	M5	5x5	85	70	105	M6	186	130	110	160	9	186	71	112	90	45	7	140	110	128	186
066	114	14	30	M5	5x5	85	70	105	M6	210	130	110	160	9	210	71	112	90	45	7	140	110	128	210
095	114	14	30	M5	5x5	85	70	105	M6	240	130	110	160	9	240	71	112	90	45	7	140	110	128	240
130	114	14	30	M5	5x5	85	70	105	M6	270	130	110	160	9	270	71	112	90	45	7	140	110	128	280

\*on request \*\* type B3/B5 and B3/B14 also available

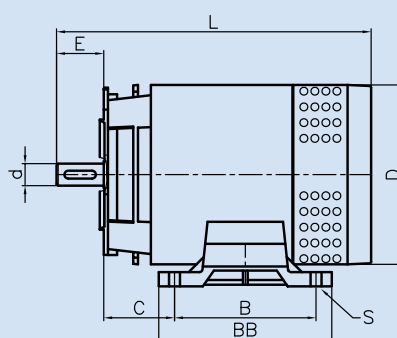
Axial force: 500 N  
Radial force: 600 N



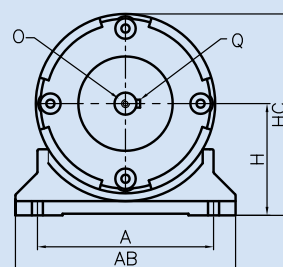
Form B14



Form B5



Form B3







# SERIES MRI

Ventilated version

No-ventilated version  
with protection level IP on request.

**Note:** gearmotors will be available on request.  
Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C.  
Dagu S.r.l. reserves the right to modify the data sheets at any time without notice.  
It is possible to request motors with speed, voltage and temperature ranges other than those listed.

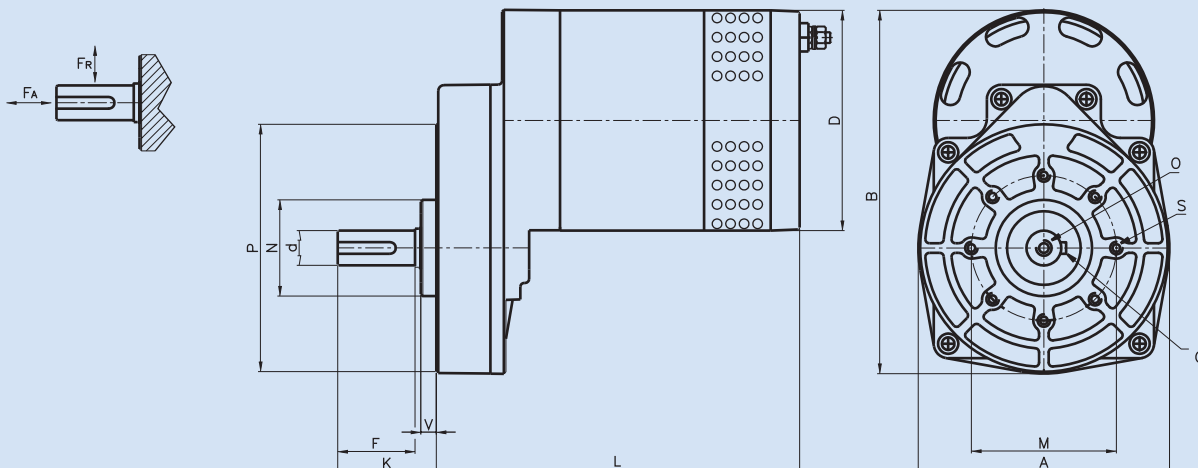
Type	Vn [V]	i	$\eta$	n* [min.-1]	Pu* [W]	J [Kg.m2]	Weight kg
033	12 dc 24 dc	10	0.98	150	200	0.2	5.5
036	12 dc 24 dc 100/115 ac 230 ac	5/10/15	0.98	150	450 200	0.05/0.2 0.2	6.5
066	12 dc 24 dc 100/115 ac 230 ac	5/10/15	0.98	150	600 380	0.1/0.4	8
075	100/115 ac 230 ac	15	0.98	150	450	0.45	8

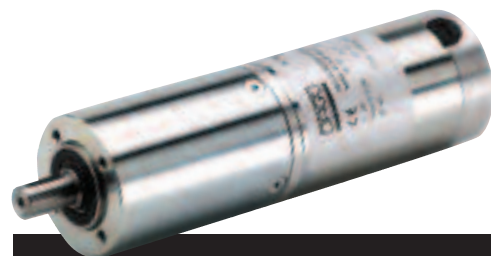
\* Customizable



Type	D	M	N	P	S	O*	Q*	d j6*	F*	K*	V*	A	B	L
033	114	75	50	128	M6x8	M8x22	4x4x16	18	40	51	8	130	188	171
036	114	75	50	128	M6x8	M8x22	4x4x16	18	40	51	8	130	188	190
066	114	75	50	128	M6x8	M8x22	4x4x16	18	40	51	8	130	188	220
075	114	75	50	128	M6x8	M8x22	4x4x16	18	40	51	8	130	188	220

\* Customizable





Gear's size	Stages	i	$\eta$	Cn S1 [Nm]	Cn S2 [Nm]	n <sub>max</sub> entry [min <sup>-1</sup> ]	Fa [N]	Fr [N]	Wheight gear [Kg]
RE52.1	1	4.071 6.375 9.6	0.9	1.2	5	4000	300	400	0.55
RE52.2	2	16.57 25.95 40.64 61.20	0.81	8	20	4000	300	400	0.70
RE52.3	3	67.49 105.67 159.13 165.46 249.17 259.08 390.15	0.71	24	30	4000	300	400	0.85
RE63.1	1	4 6	0.9	28	45	4000	300	400	0.60
RE63.2	2	16 24 36	0.81	45	80	4000	300	400	0.90
RE63.3	3	64 96 144 216	0.72	55	95	4000	300	400	1.20
RE80.1	1	4 6	0.9	40	65	4000	500	600	1.30
RE80.2	2	16 24 36	0.81	75	95	4000	500	600	1.90
RE80.3	3	64 96 144 216	0.72	95	130	4000	500	600	2.50
RE105.1	1	4 6	0.87	90	130	3000	800	1000	2.50
RE105.2	2	16 24 36	0.79	160	250	3000	800	1000	3.50

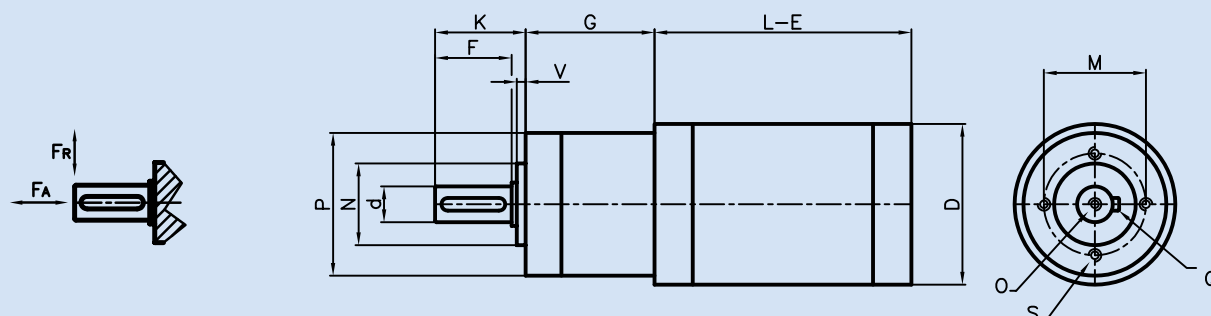
## SERIES MRE

Version with protection level IP on request.

**Note:** gearmotors will be available on request. Data shown on the tables are approximate. They refer to a temperature of 20° C with a temperature range from 0° to 25° C. Dagu S.r.l. reserves the right to modify the data sheets at any time without notice. It is possible to request motors with speed, voltage and temperature ranges other than those listed.

Type	M	N	P	d h7	S	O	Q	F	K	G	V	L-E motor
RE52.1	40	32	52	12	M5x8	M4x8	4x4x16	20.8	25	45.5	2	ME40/45/56**
RE52.2	40	32	52	12	M5x8	M4x8	4x4x16	20.8	25	61	2	ME40/45/56**
RE52.3	40	32	52	12	M5x8	M4x8	4x4x16	20.8	25	76.5	2	ME40/45/56**
RE63.1	40	32	63*	14	M5x8	M5x8	5x5x25	30	36	44	3	ME45/56**
RE63.2	40	32	63*	14	M5x8	M5x8	5x5x25	30	36	64	3	ME45/56**
RE63.3	40	32	63*	14	M5x8	M5x8	5x5x25	30	36	84	3	ME45/56**
RE80.1	65	50	80	19	M6x10	M6x12	6x6x30	40	43.5	65.2	2.5	ME56/63**
RE80.2	65	50	80	19	M6x10	M6x12	6x6x30	40	43.5	85.2	2.5	ME56/63**
RE80.3	65	50	80	19	M6x10	M6x12	6x6x30	40	43.5	105.2	2.5	ME56/63**
RE105.1	85	70	105	24	M8x17	M8x16	8x7x40	50	55	68.5	2.5	ME63/71**
RE105.2	85	70	105	24	M8x17	M8x16	8x7x40	50	55	97.5	2.5	ME63/71**

\*60 mm version on request \*\*see series motor characteristics





## DRIVERS HFR 1D

The unidirectional high frequency electronic control unit with energy recovery type HFR1D has been added to the newest range. Conceived for permanent magnet motors, this equipment complies with the newest security provisions for the application on EC-vehicles and is produced in a wide power range (from 60 A up to 150 A). The acceleration adjusting device allows the vehicle to gradually and regularly reach the maximum speed. The current limiter enables the operator to adjust the max. current supplied to the motor.

This control unit is provided with a variable regenerative braking whose max. value is fixed by the recovery braking adjusting device.

### MAIN TECHNICAL FEATURES

- Presettable limiter of the max. current supplied to the motor.
- Thermal limiter with a proportional action.
- Recovery braking system activated by deceleration or by pedal release.
- Presettable limiter of max. braking current.
- Control system by a 5K or a 10K potentiometer connected to 3 wires.
- Control system by a potentiometer connected to 2 wires with adjusting angle upon request.
- Total protection against battery polarity inversion by means of an internal line relay.
- Protection against short circuits of the mos units.
- Protection against potentiometer breakdown.
- Intervention of the safety block when, turning the key the potentiometer is not on the value O.
- Disabling of the safety block by resetting the potentiometer to the value O.

Voltage rating	<b>12-24-36V</b>
Allowed supply variation	<b>85 ÷ 125%</b>
Operation frequency	<b>≥18Khz</b>
Operation temperature	<b>-20 +40°C</b>
Humidity at 25°C	<b>90%</b>
Thermal limiter action	<b>80°C</b>
Max voltage supplied at 12 Vb	<b>94%</b>
Max voltage supplied at 36 Vb	<b>98%</b>
Weight	<b>500 g</b>

Size	Starting current	Current/min	Current/hour
60 A	60 A	55 A	21 A
90 A	90 A	81 A	32 A
120 A	120 A	110 A	42 A
150 A	150 A	135 A	53 A







The bidirectional high frequency electronic control unit with energy recovery and aided by microprocessor type 4QHF 2D has been added to the newest range. Conceived for permanent magnet motors and realized in compliance with the most recent security provisions for the application on EC-vehicles, it is produced in a wide power range (from 45 A up to 140 A).

This control unit is provided with a variable regenerative braking that can be adjusted by the operator according to his needs and acts during the vehicle's deceleration, reverse and by pedal release.

#### MAIN TECHNICAL FEATURES

- Control unit aided by microprocessor.
- Operation parameters adjustable through a programming display or by PC.
- Slow starting through adjustable acceleration slope.
- Settable limiter of the max. current supplied to the motor.
- Proportional action thermal limiter.
- Recovery braking system activated during deceleration, by pedal release and in reverse.
- Settable limiter of the max. braking current.
- Control system by a 5K potentiometer connected to 3 wires.
- Control system by a potentiometer connected to 2 wires with adjusting angle on request.
- Total protection against battery polarity inversion thanks to an internal line relay.
- Intervention of the safety block in case of short circuit of the Mos units.
- Intervention of the safety block in case of potentiometer breakdown.
- Intervention of the safety block when, turning the key, the potentiometer is not on O and disabling by resetting the potentiometer to O.

Voltage rating	<b>12-24-36-48V</b>
Allowed supply variation	<b>85 ÷ 125%</b>
Operation frequency	<b>16Khz</b>
Operation temperature	<b>-20 +40°C</b>
Humidity at 25°C	<b>90%</b>
Thermal limiter action	<b>70 ÷ 80°C</b>
Weight 4QHF 2D 45/60 A	<b>350 g</b>
Weight 4QHF 2D 90/140 A	<b>500 g</b>

Size	Starting current	Current/min	Current/hour
45 A	45 A	40 A	18 A
60 A	60 A	55 A	21 A
90 A	90 A	81 A	32 A
140 A	140 A	121 A	48 A



## DRIVERS 4QHF 2D

# PRODUCT REQUEST



## APPLIER DATA

Company / Name and surname:

Address:

City:

Telephone and Fax:

Referent:

E-mail:

## PLEASE SEND:

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Informations    | <input type="checkbox"/> Offer for sampling | <input type="checkbox"/> Offer for n° _____ pieces      |
| <input type="checkbox"/> To be contacted | <input type="checkbox"/> n° _____ samples   | <input type="checkbox"/> Offer for n° _____ pieces/year |

## PRODUCT AND CHARACTERISTICS

- |   |  |                                |
|---|--|--------------------------------|
| <input type="checkbox"/> ME Electric motor            | <input type="checkbox"/> MRE Planetary gearmotor |                                |
| <input type="checkbox"/> MRI Parallel shaft motorgear | <input type="checkbox"/> MRV Worm gearmotor      | <input type="checkbox"/> Other |

Nominal voltage \_\_\_\_\_ V    Nominal power \_\_\_\_\_ W    Nominal torque \_\_\_\_\_ Nm

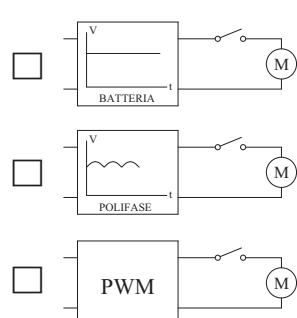
No loaded speed \_\_\_\_\_ min<sup>-1</sup>    Speed at nominal load \_\_\_\_\_ min<sup>-1</sup>    Construction type \_\_\_\_\_

Service \_\_\_\_\_    Protection rating IP \_\_\_\_\_    Transmission ratio \_\_\_\_\_

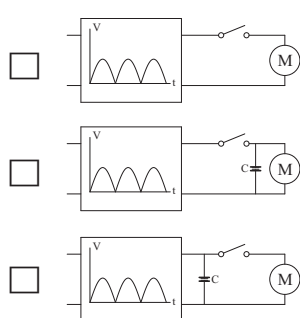
Working mode:    ☐ Clockwise only    ☐ Counter clockwise only    ☐ Two directions

## POWER SUPPLY SYSTEM

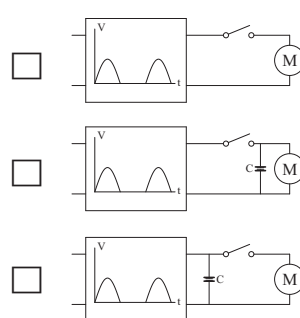
### Form factor $\approx 1$



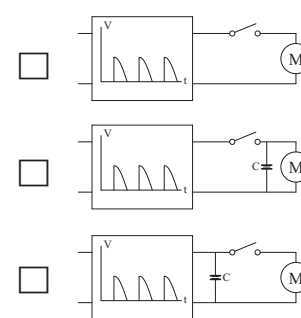
### Form factor = 1.11



### Form factor $\geq 1.52$



### Form factor $>1,11$



## WORKING CONDITIONS

- |   |  |
|---|--|
| <input type="checkbox"/> Full immersion in liquid _____               | <input type="checkbox"/> Subjected to axial vibration _____        |
| <input type="checkbox"/> Shaft side immersed in liquid _____          | <input type="checkbox"/> Subject to transversal vibration _____    |
| <input type="checkbox"/> Rear of the motor immersed in a liquid _____ | <input type="checkbox"/> Subject to shock _____                    |
| <input type="checkbox"/> Operating in cleaned air _____               | <input type="checkbox"/> Operating in humid or corrosive air _____ |

## OPERATION DESCRIPTION:

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## EXTERNAL FINISH

Components surface protection:

- |  |   |
|--|---|
| <input type="checkbox"/> Non requested           | <input type="checkbox"/> Protection is preferable                           |
| <input type="checkbox"/> Electrical junction box | <input type="checkbox"/> Non protected terminal                             |
| <input type="checkbox"/> Cable lenght _____ m    | <input type="checkbox"/> Protection is necessary - Type of protection _____ |

D.Lgs. 196/2003.



# DAGU WORLDWIDE



## WARRANTY

Dagu S.r.l. guarantees that its motors are devoid of material and manufacturing defects, as long as they are used for their intended purpose and in compliance with the conditions specified on the rating plate.

The warranty expires 24 months following the date stamped on the motor, or immediately if the motor has been tampered with or damaged during carriage or following improper use or any other cause not related to manufacturing defects or quality of the materials.

Dagu S.r.l. shall decide whether to repair or replace faulty motors that are still covered by the warranty. Dagù S.r.l. shall not be liable for any expenses related to replacement, carriage or damage to persons or things. The aforesaid expenses shall be to the Customer's account.

Dagu S.r.l. shall not reimburse any expenses for repairs carried out by others who have not been authorised in writing by Dagù S.r.l..

Dagu S.r.l. does not recognise any other warranty obligations besides the contents of warranty clauses expressed herein.



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